

# **Auxiliary Water Supply for Fish Ladders**

## **FY99 Work Plan**

### **1. Purpose/Objective**

The Corps of Engineers plans to complete Phase II of an evaluation of the emergency auxiliary water supply system for the adult fish ladders at lower Snake River projects. The objective of the evaluation is to assess the reliability of the existing systems and identify an alternative for detailed design and implementation if determined necessary.

The Phase I report was completed in 1995. That report describes the components and the operation of the existing systems and identifies a wide variety of potential alternatives for improving system reliability. Phase II work scheduled for 1996 was deferred due to funding constraints.

It was the Corps intent to complete the Phase II evaluation in FY97. However, upon the request of NMFS staff and others, the Corps re-scoped the evaluation to include an overall performance and efficiency evaluation of the existing facilities.

While the scope is limited to Snake River projects only, information generated may have application to mainstem Columbia River projects in which similar evaluations are being conducted.

### **2. Activities/Tasks**

A Feature Design Memorandum (FDM) shall be prepared which will evaluate, in greater detail, the alternatives previously identified in the Phase I technical report. The FDM will evaluate and recommend, on a project by project basis, a selected alternative for providing emergency auxiliary water supplies for each of the adult ladder systems at each of the four lower Snake River dams. The FDM will also identify a baseline construction cost estimate including E&D and S&A costs. The FDM will present a proposed schedule for completing the design and construction of the recommended alternatives for each dam. Major tasks to be completed as a part of this evaluation are as follows:

Task 1. Investigate and evaluate the adult fishway water supply systems performance at each of the Snake River projects, using a base discharge rather than weir submergence. Compare the results of the field testing to the predicted discharges and head differentials.

Task 2. Investigate and evaluate, in further detail, the emergency water supply alternatives identified in the Phase I technical report.

Task 3. Prepare recommendations concerning emergency auxiliary water supplies for each of the ladder systems at each of the four lower Snake River dams.

Task 4. Prepare FDM level drawings of recommended alternatives.

Task 5. Prepare draft FDM describing investigations, field studies, evaluation of alternatives, and recommendations.

Task 6. Prepare a final FDM, which will include baseline cost estimates including E&D, S&A and construction and construction, schedules. The final baseline cost estimates will not include required Operations and Maintenance on existing equipment.

### 3. Schedule of Major Activities

ID	Task Name	FY99	1999											
			Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul		
1														
2	Complete Project Evaluations	\$80k												
3	Complete Draft Report	\$50k												
4	Review Draft Report	\$25k												
5	Prepare Final Report	\$30k												
6	Total	\$185k												

### 4. Other Information

a. Biological Opinion Measure - Incidental Take Statement Measure # 16 requires the Corps to complete an evaluation of the emergency auxiliary water supply capabilities of the lower Snake projects by March 1996. Due to budget constraints, the SCT determined this work to be of a lower priority and the work was deferred.

b. ESA Effects - Delays in completing this report were coordinated extensively with the region. It was determined through this coordination that the incidental take was sufficiently minimized. (See framework letter dated November 14, 1996)

c. Points of Contact

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# **Lower Snake River Feasibility Study**

## **FY 99 Work Plan**

**1. Objectives.** The geographical scope of the study is the lower Snake River, from the confluence with the Columbia River to the upper end of Lower Granite reservoir (near Asotin, Washington). The primary objectives of the study are:

- Develop a plan to improve migration conditions for salmon on the lower Snake River.
- Develop a plan that fits within the framework of a regionally developed recovery plan.
- Evaluate an array of alternatives that will satisfy the requirements of the National Environmental Policy Act.
- Coordinate all phases of the study with regional interests and the public.
- Develop documents that can, if necessary, be used for congressional authorization and appropriations.

## **2. Activities / Tasks.**

There are two major milestones to be completed in FY 99. One is the release of the draft Feasibility Report / Environmental Impact Statement (EIS) for public review in late April or early May. The other milestone is the completion of the final EIS in December. A major assumption used in the development of this work plan is that a preferred plan of action will be identified in the draft EIS.

Due to the regional significance of this issue and the fact that the resulting actions could become a major part of the overall Snake River salmon recovery plan, it is the Corps desire to have a regional consensus on the recommendation for the final EIS. The Corps will engage regional decision-makers in an effort to coordinate and collaborate to achieve this consensus. However, if necessary the Corps will be positioned to make a recommendation if regional consensus is not reached.

The majority of the work items in FY 99 are related to the completion of the technical working documents, appendices, and the EIS and NEPA procedural requirements. There is a considerable amount of technical work being completed in FY 99. This is due to some minor schedule slips in FY 98. In addition to completing the initial work products there will be some fine-tuning and revising resulting from technical, agency and public reviews. The work elements and evaluations being conducted for this study are all considered necessary to meet the primary objectives identified above. The specific products and tasks identified for FY 99 are as follows:

a) Hydrologic Studies. It is anticipated that the majority of the hydrologic studies will be completed in FY 98. These include hydroregulation modeling, flow target analysis, water travel time analysis, and sediment transport analysis. However, it is expected that there may be some additions and adjustments to these studies as a result of technical, agency and public reviews. There may even be some new alternatives that need to be evaluated. The Hydrologic Report/Appendix will be finalized in early FY 99.

b) Engineering Studies. The Major System Improvements Engineering Appendix and the Drawdown Engineering Appendix will be finalized in early FY 99. There may be some fine-tuning of this studies/appendices, as a result of technical and agency reviews.

c) Socio-Economic Studies. There are many different social and economic related studies that will continue in FY 99. This work is all being coordinated or conducted through the Drawdown Regional Economic Workgroup (DREW). The specific studies include: power, navigation, irrigation, recreation and commercial fisheries analysis; cost effectiveness; risk and uncertainty; social effects; regional economic effects; and, tribal circumstances. The preparation of the Socio-economic appendix will also occur in FY 99. This includes a thorough independent technical review by the Independent Economic Advisory Board (IEAB) for the Northwest Power Planning Council. Here again, it is anticipated that these studies and the appendix will be revised in FY 99 based on technical, agency and public reviews.

d) NEPA. In FY 99, Foster-Wheeler Environmental Corp. (contractor) will be preparing the preliminary draft, draft, preliminary final and final Environmental Impact Statement. The USFWS will be preparing the Coordination Act Report, which is considered part of the NEPA process. Also included in this task is the preparation of an air quality analysis. A separate appendix for Air Quality may be prepared. A Biological Assessment (to include A-Fish and non-A-Fish species) will be prepared. Comprehensive internal and agency reviews are included in this task. The Draft EIS is scheduled for distribution for public review in late April or early May 1999. The Final EIS is scheduled for completion in December 1999. As mentioned earlier, it is anticipated that the draft EIS will identify a "preferred plan of action", if appropriate. Preparation of the ROD is scheduled for FY 2000.

e) Anadromous Fish. PATH and NMFS are preparing the qualitative and quantitative analysis for this study. AFEP has proposed minor additional research for this study in FY 99. Additional baseline data is needed. However, there will be time in 2000 or later to collect this data prior to the implementation of the preferred plan so there is no need to initiate this research in 1999. The bottom line is - funds for FY 99 will only be programmed to wrap-up the A-Fish analysis and appendix. No new AFEP studies will be funded in FY 99.

f) Resident Fish and Water Quality. The Resident Fish and Water Quality Appendix will be finalized in FY 99. This work is being done by contract. It is expected that there will be some fine-tuning and revising of these studies/appendices, as a result of technical, agency and public reviews. There is a chance that two separate appendices (Water Quality and Resident Fish) will be prepared. This will be based on the projected size of the appendices.

g) Wildlife. The Wildlife Appendix will be finalized in FY 99. Note the CAR requirements are included in NEPA. There may be some revisions to the appendix, as a result of technical and agency reviews.

h) Cultural Resources. The Cultural Resource Appendix will be finalized in early FY 99. There may be some fine-tuning of these studies/appendices, as a result of technical, tribal and agency reviews.

i) Public Involvement. There will be extensive regional coordination and public involvement in FY 99. Particularly, when the DEIS is distributed for public review. This coordination and involvement will take the form of public meetings and hearings, workshops, newsletters, web page updating, etc.

j) Plan Formulation and Decision Analysis. A decision analysis process will continue to be developed and implemented in FY 99. A contractor will perform this work. The objective of this process is to help facilitate the development of a regionally preferred plan of action. The examination of trade-offs is anticipated to be the cornerstone of decision analysis. The Corps is planning to develop a model that will use the information that is developed in all the tasks mentioned above. This model will allow all the information to be graphically displayed so that decision-makers and others can easily see how the various criteria are affected by the alternatives. This model will also allow the decision-makers to conduct numerous sensitivity analysis scenarios to see how changing the information or changing how it is weighted might change the ranking of management actions.

k) Management. Internal management and supervision related to this study will continue in FY 99.

l) Implementation Plan. A specific implementation plan will be developed for the draft EIS. This plan will be based on the preferred plan of action.

m) Fish & Wildlife Mitigation Plan. A mitigation plan for fish and wildlife will be prepared for the preferred plan of action. This plan will be fully coordinated with the USFWS.

**3. Schedule and Costs.** The estimated study costs for FY 99 is \$4,250,000. The summary schedule and breakdown of FY 99 costs for this feasibility study is shown on enclosure 1.

**4. Other Information.**

a) Overview. This work plan provides a summary of the various Lower Snake River Feasibility Study elements (products, tasks, costs, etc.) that are to be performed in FY 99. This information is extracted from the Project Study Plan (PSP) which identifies all of the various study products, tasks, costs, schedules and responsible elements. The PSP should be referenced if more detailed information is required.

b) Biological Opinion Measure. Reasonable and Prudent Measure (RPA) No. 10 requires the Corps to complete this feasibility study and make a decision or recommendation in 1999. This recommendation will outline the long-term strategy for the operation and configuration of lower Snake River. It is anticipated that this long-term strategy will become a major part of the overall recovery plan.

c) Points of Contact.

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Anneli Aston - NEPA Coordinator	(509) 527-7263

ID	Task Name	FY 99 Cost	1997					1998				
			Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
1	Hydrologic Studies/Appendix	\$45										
5	A Fish Studies/Appendix	\$800										
6	Drawdown Engineering Appendix	\$125										
7	Surface Collection Eng. Appendix	\$125										
8	Real Estate Appendix	\$30										
9	Cultural Resources Appendix	\$75										
10	Wildlife Appendix	\$65										
11	Resident Fish/WQ Appendix	\$400										
12	Socio-Economic Appendix	\$450										
13	Public Outreach Program/Appendix	\$180										
14	Plan Formulation Appendix	\$190										
15	Projects & Study Management	\$400										
16	Feasibility Review Conference	\$0										◆
17	Draft EIS	\$750										
18	Final CAR / Biological Assessment	\$75										
19	Final EIS (w/Public Review)	\$540										
20	Division Engineer Issues Notice / Initiate PED	\$0										

# **Little Goose Extended Length Screens**

## **FY 99 Work Plan**

### **1. Purpose/Objective**

Extended submerged bar screens (ESBS's) were installed at Little Goose in the spring of 1997. NWW is working actively to resolve ESBS issues for the operation of the turbine intake screen systems. Several issues have been problematic to a point they cannot be considered maintenance issues. These system improvements are necessary to ensure that screens can function properly throughout the juvenile out-migration season, and require only standard operation and maintenance tasks. The proposed FY 99 work is a continuation of work required to ensure a completed and properly operating juvenile bypass system.

### **2. Activities & Tasks**

- a. Screen Cleaning Control System - Prior to the 1997 fish season, ESBS's at McNary Dam were completely retrofitted with an improved brush bar limit switch control system. The new system was installed the winter of 1996/97, and tested for reliability during the 1997 season. The current limit switches at Little Goose are not reliable, and cause substantial unit downtime and unscheduled maintenance tasks during the fish season. To ensure system reliability, it is necessary to retrofit the ESBS's at Little Goose with a new limit switch control system similar to McNary's.

The screen control system also requires a dependable seal between the motor and the gearbox. During the 1997/98 winter maintenance at Little Goose it was observed that most motor seals failed. It will be necessary to install new motor seals, couplings, and gearbox lubricant to ensure proper screen cleaning operation.

- b. Automated Orifice Back-flush System. Each of the orifices at the project has pressurized air back-flush systems. If an orifice becomes blocked or partially blocked, one of the project's maintenance staff can close the valve and activate the air back flush to try and dislodge the debris. At Little Goose, project personnel are required to manually back-flush all the orifices every 2-3 hours throughout the season to prevent serious blockages, and some blockages still occur. This is very labor intensive. An automated system to close the valves, activate the air back-flush system, and reopen the valves on a regular schedule would relieve some of the demands on the maintenance crews at Little Goose.



A Programmable Logic Controller (PLC) would control the proposed back-flush system.

c. Trash Shear Boom - Little Goose Dam is not equipped with a trash-shear debris boom to intercept floating debris in the forebay, as was installed at Lower Granite Dam. In high flow years, the upstream Lower Granite Dam passes substantial debris downstream to Little Goose. With no way to intercept incoming debris in the forebay at Little Goose, large debris fields accumulate in front of the powerhouse. When this debris becomes waterlogged it is pulled into the turbine intakes. The larger debris is intercepted by the intake trash racks, but the smaller debris (less than six inches diameter on the smallest axis) passes into the gatewells and into the juvenile fish collection system. Debris control efforts in other areas of the collection system will be minimized when the debris can be prevented from entering the system by installing a trash shear boom.

In FY 99, site investigations will be conducted, and contract drawings and specifications will be prepared for the trash-shear boom design. A construction contract will be advertised in FY 00 to start installation of the trash boom.

d. ESBS Revisions. NWW performed tests at Little Goose Dam and McNary Dam in February 1998 to determine if turbine operating ranges can be identified which will alter frequency vibration on the perforated plate connections, and potentially extend the life of the plate connections. The hydraulic tests provided data necessary to redesign the perforated plates and connections. The data was used to determine structural loads and vibration frequencies, so a final design can be developed to increase the design life of the screen system. This analysis will include structural computer modeling, structural analysis, and design.

In FY 99, a contract will be prepared to fabricate, deliver, install, and field test redesigned plates and connections at required locations on an ESBS at both Little Goose and McNary. The plates will be installed and subjected to various loading conditions to verify performance, similar to the mechanical field tests. In addition to the contract, it is anticipated WES staff will be utilized to perform data collection and analysis. After verification, If tests verify the design, a final contract will be implemented in FY 2000 to retrofit or replace the existing perforated plate and connections at all NWW projects with ESBS systems.

e. AFEP Activities. Evaluate the biological effects of juvenile fish passage through an enlarged 14-inch diameter orifice compared to the current 12-inch diameter orifice. Verify the orifice passage efficiency (OPE) rate with the enlarged orifice; and monitor orifice plugging debris improvements. (See one-page summaries attached)

### 3. Schedule & Costs

ID	Task Name	FY99	1999					2000	
			Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2
1	<b>ESBS Plan/Eng/Design/Construction</b>								
2	Trash Shear Boom Design	\$200k					5/28		
3	Screen Cleaning Control Sys	\$700k							
4	Automated Orifice Back Flush Sys.	\$150k							
5	ESBS Perforated Plate Revisions	\$75k							
6	Anadromous Fish Evaluations	\$75k							
7	Total	<b>\$1200k</b>							

### 4. Other Information

a. Biological Opinion Measure - Reasonable and Prudent Measure #19 required the Corps to complete installation of ESBS's at Little Goose by the 1996 out-migration. A one-year delay occurred due to design and fabrication problems. The schedule was close to being met, but would have caused extensive unit outages during a period of relatively high flows. The region elected to delay the completion of the work by one year.

b. ESA Effects - N/A

c. Points of Contact:

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Rebecca Kalamasz, AFEP

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# **Lower Granite Extended Length Screens**

FY 99 Work Plan

## **1. Purpose/Objective**

Extended submerged bar screens (ESBS's) were installed at Lower Granite in the spring of 1996. NWW is working actively to resolve ESBS issues for the operation of the turbine intake screen systems. Several issues have been problematic to a point they cannot be considered maintenance issues and require corrective action. These system improvements are necessary to ensure that screens can function properly throughout the juvenile out-migration season, and require only standard operation and maintenance tasks. The proposed FY 99 work is a continuation of work required to ensure a completed and properly operating juvenile bypass system.

## **2. Activities/Tasks**

- a. Screen Cleaning Control Systems - Prior to the 1997 fish season, ESBS's at McNary Dam were completely retrofitted with an improved brush bar limit switch control system. The new system was installed the winter of 1996/97, and tested for reliability during the 1997 season. The current limit switches at Lower Granite are not reliable, causing substantial unit downtime, and unscheduled maintenance tasks during the fish season. To ensure system reliability, it is necessary to retrofit the ESBS's at Lower Granite with a new limit switch control system similar to McNary's.

The screen control system also requires a dependable seal between the motor and the gearbox. During the 1997/98 winter maintenance at Lower Granite, it was observed that most motor seals had failed. It will be necessary to install new motor seals, couplings, and gearbox lubricant to ensure proper screen cleaning operation.

- b. Automated Orifice Back-flush System. Each of the orifices at the project has pressurized air backflush systems. If an orifice becomes blocked or partially blocked, one of the project's maintenance staff can close the valve and activate the air backflush to try and dislodge the debris. At Lower Granite, project personnel are required to manually backflush all the orifices every 2-3 hours throughout the season to prevent serious blockages. However, some blockages still occur. This is very labor intensive. An automated system to close the valves, activate the air backflush system, and reopen the valves on a regular schedule would relieve some of the demands on the maintenance crews

at Lower Granite. A Programmable Logic Controller (PLC) would control the proposed back-flush system.

### 3. Schedule & Costs

ID	Task Name	FY99	1998			1999				2000	
			Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2
1	<b>ESBS Plan/Eng/Design/Construction</b>										
2	Screen Cleaning Control System	\$700k									
3	Automated Orifice Back Flush System	\$250k									
4	Total	<b>\$950k</b>									

### 4. Other Information.

a. Biological Opinion Measure - Reasonable and Prudent Measure #19 requires the Corps to complete installation of ESBS's at Granite by 1996 outmigration. That requirement was met.

b. ESA Effects - N/A

c. Points of Contact:

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# **Lower Granite Turbine Model**

## **FY99 Work Plan**

### **1. Purpose/Objective.**

The Lower Granite Turbine Evaluation was initiated in 1994. The purpose of this evaluation is to provide information on the effect of fish screening devices on turbine performance and the resulting impact on fish passage through the turbine. The results of this evaluation and continued use of the model constructed for this evaluation will be applied to the continuing system wide Turbine Survival Program

There are three main objectives of the Lower Granite Turbine Evaluation study.

- Evaluate the effect of fish screen devices on overall turbine efficiency and recommend improved operational guidelines, where appropriate, under normal operating pool levels. The current operational guidelines for turbines were developed from model studies conducted without fish screen devices in the intake. Fish screens cause a dramatic change in velocity distribution which impacts overall unit efficiency. If increased efficiencies can be gained by modifying turbine-operating guidelines, savings in energy as well as improved fish passage may be possible.
- Evaluate the hydraulic aspects of flow through the turbine and downstream areas in regard to potential impacts on fish passage. If possible, obtain information concerning cavitation and shear flow phenomenon and document with video footage.
- Evaluate the effect of reservoir pool drawdown operations on overall turbine efficiency with and without intake screening and associated effects on fish passage.

The FY99 study objective includes completion of physical hydraulic modeling (turbine model) activities.

## 2. Activities/Tasks/Schedule

ID	Task Name	FY98	1998				1999				
			Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
1	Granite Turbine Model Contract	0									
2	Phase II model Testing										
3	Phase II Preliminary Report										
4	Delivery of Turbine Model to District										
5											
6	Government Supervision	\$100K									
7											
8	Total	\$100k									

## 3. Other Information

a. Biological Opinion Measure - Conservation Recommendation #5 requires the Corps to comprehensively study the engineering and biological aspects of juvenile fish passage through turbines. The Granite Turbine Model work item is an element of that BiOp requirement. Upon completion of the contract related to this model, future expenditures and use of the model will be included in the Turbine Evaluation Program.

b. ESA Effects - N/A

c. Points of Contact:

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Rick Emmert - Technical Manager	(509) 527-7536

# Ice Harbor Flow Deflectors

## FY 99 Work Plan

### 1. Purpose/Objectives

The Phase I contract for the construction of spillway deflectors on spill bays 2-9 was completed in November 1997. The FY99 objective is to complete the Phase II work, which includes construction of spillway deflectors on bays 1 and 9 to further reduce dissolved gas generation and to install a training wall extension which will provide for better entrance conditions to the north shore fish ladder. Additional work will include the construction of coffer cells immediately downstream of the navigation lock, which will mitigate for adverse impacts to navigation as a result of the previous installation of spillway deflectors.

### 2. Activities/Tasks

a. Phase II. The feature design memorandum (FDM) was completed in FY 98. The FDM recommended moving forward on construction of flow deflectors in spillway bays 1 & 10, construction of an extension to the training wall which separates spill bays 9 & 10, and construction of four 40-foot diameter coffer cells to mitigate for the adverse affects of flow deflectors on river navigation. The addition of spillway deflectors 1 & 10 will reduce dissolved gas levels at the north shore fish ladder, and 3-4% four miles downstream of the spillway. Also, spillway discharges can be increased from 50,000 cfs to 75,000 cfs and maintain the 120% total dissolved gas (TSG) limits. Phase II contract documents (plans and specifications) were completed in March 1998. The contract was awarded in May 1998. Construction began in June 1998. The inwater work began in September 1998.

### 3. Schedule & Costs

ID	Task Name	FY99						1999		
			Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
1										
2	Complete Construction	\$3,800k								

#### **4. Other Information.**

a. Biological Opinion Measure - Reasonable and Prudent Measure #18 requires the Corps to implement a gas abatement program. Within that measure was a specific requirement to construct flow deflectors at Ice Harbor.

b. ESA Effects - N/A

c. Points of Contact:

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# **Fish Ladder Temperature Control Evaluation**

## **FY99 Work Plan**

### **1. Purpose/Objective**

The long-term objective of this study has been to define any problems that may exist specific to effects of fish ladder water temperature on adult salmon and steelhead and to determine feasible methods of mitigating any adverse affects.

Fish ladder temperature data collection has been completed.

### **2. Activities/Tasks**

Activities and tasks scheduled for FY99 will be limited to completion of a report, which will summarize the evaluation of all available temperature data and make recommendations for future actions.

The following are potential activities for FY99 or beyond:

- a) Complete a technical report that will document the information gathered concerning temperatures and biological effects & document whether a problem exists or not.
- b) If a problem is not identified, then the investigations will stop.
- c) If a problem is clearly identified, then
  - i) Alternative engineering solutions will be proposed and evaluated.
  - ii) A solution will be selected for prototype installation and evaluation.
  - iii) Costs and schedules will be identified.
  - iv) Biological test protocol will be defined.

### **3. Schedule & Costs**

A total of **\$60k** has been programmed in FY99 for the report preparation and coordination activities with regional entities.

### **4. Other Information**

a. Biological Opinion Measure - Incidental Take Statement Measure (IT) #18 required the Corps to provide water temperature control in fish ladders. The measure further required testing of a prototype in 1996/97. By letter dated July 14, 1995, the Corps proposed a change to the implementation schedule identified in the biological opinion to allow for the gathering of additional ladder

temperature data on which to define the problem and to base an engineering solution. SCT concurred with this recommendation at the September 18, 1995 meeting on the basis that it is necessary to obtain more information on the nature and extent of ladder temperature problems before designing solutions.

b. ESA Effects - The change in schedule has been thoroughly discussed with regional entities. It was determined that the change in schedule would not represent a change in the estimated incidental take of adult Snake River salmon. (See framework letter dated November 14, 1996)

c. Points of Contact

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# McNary Extended Length Screens

## FY99 Work Plan

### 1. Purpose/Objectives.

Reservoir debris from river run-off complicated by chronic mechanical failures related to design/manufacturing deficiencies of the ESBS's/VBS's, continues to cause major problems in operating the new project juvenile fish facilities. FY99 objectives related to these issues are as follows:

- Identify long term strategy for resolving the problems associated with floating debris in the river.
- Complete System Wide Letter Report, which will identify a strategy for dealing with all problems, associated with the safe, reliable and economic operation of the ESBS's.

### 2. Activities/Tasks

a. Reservoir Debris Management - Short Term - A contract is underway to periodically collect debris in the forebay, remove, and chip the debris prior to it entering the new juvenile fish facilities. This contract will continue in place until a final reservoir debris management solution is implemented.

b. NWD System Wide ESBS Report - A Northwestern Division(NWD) system wide report will be completed in FY 1999 and it will identify all required design modifications, and final repairs to the ESBS's at projects where ESBS's are or will be deployed. This report will integrate the information relative to the operations and debris management issues at all Lower Snake and Columbia River projects, make final recommendations, and provide baseline cost estimates for long term resolution of all screen related problems.

c. Orifice Shelters. An orifice shelter is a structure with a triangular cross section placed below the collection channel orifices and extends across the width of the gatewell. Various sizes and shapes of orifice shelters were tested at Waterways Experiment Station (WES), in the 1:12 turbine models. The two most promising designs were also tested in a 1:4 scale orifice model. Both shapes tested completely eliminated the orifice plugging problem. One of the shapes tested (2 feet wide by 8 feet deep) also showed a positive pronounced influence on gatewell conditions and orifice behavior at McNary. With the orifice shelter in place, flow lines in the gatewell were more uniform and vertical up to

the level of the orifice shelters. Debris introduced into the gatewell cleared out through the orifice quickly, which will also increase orifice passage efficiency (OPE). Two orifice shelters were prototype tested at McNary in the spring of 1998. The effects on debris were evaluated, along with the biological impacts (OPE and descaling). The orifice shelters proved to be successful by substantially reducing debris plugging on the VBS's, and showed improvement of hydraulic conditions through the orifice, including increased OPE. They will be installed at McNary in FY 99.

d. Upgrade Dewater Screen Panels. The primary floor dewatering panels at McNary are made of wedge wire bars, with the bars aligned parallel to the flow of water in the collection channel. The brush screen cleaner keeps the surface of the screen clean, but small twigs, tumbleweeds, straw, and other fine debris gradually plug up the spaces between the bars. Periodically, the collection channel must be dewatered so maintenance crews can pressure wash the screens. Two types of modified screen panels were tested in 1997. One type was an existing screen panel with fine polyester mesh covering the wedgewire bars. The other type was a new screen panel with the wedge wire bars aligned perpendicular to flow. Both types of test panels showed promising results. However, it is recommended that the existing panels be replaced with the new perpendicular-bar panels. The perpendicular-bar panels will have lower maintenance costs, and a longer life than the mesh-covered panels.

e. Cylindrical Dewatering Structure Floor dewatering systems are difficult to keep clean, to inspect, and maintain because they are submerged. The systems require complicated submerged cleaning systems that are working against the flow to remove debris material, and require that the system be dewatered for maintenance. A sloped, cylindrical dewatering screen system eliminates these problems while providing other benefits as well. Advantages of the system include: greater wetted screen surface for lower through-screen velocities; larger total screen area allows the system to handle greater debris volumes; and allows for easy visual inspection during operation. Part of the screen is always out of the water and can utilize a simple, effective, above-water-level screen cleaning system. Debris can be completely removed at the source and not be passed on through the fish facility. Because of the potential benefits for any new dewatering structures built in the future, such as at Lower Granite, or the potential for major modifications becoming necessary at existing dewatering structures to handle debris more effectively, a pilot test facility should be built to provide an opportunity for hydraulic, biological, debris, and reliability testing. McNary is the proposed location for the FY 2000 test because it has a wide variety of debris, both fine and coarse woody debris, and results would be applicable at all locations. McNary also has a history of floor dewatering screen problems, so the test could be retrofitted as a permanent solution if determined successful.

f. ESBS Revisions. The Walla Walla District performed tests at McNary Dam and Little Goose Dam in March of 1998 to determine if turbine operating ranges can be identified which will alter frequency vibration on the perforated plate connections, and potentially extend the life of the plate connections. The hydraulic tests provided data necessary to retrofit the perforated plates and connections. The data will be used to determine structural loads and vibration frequencies, so a final design can be developed to increase the design life of the screen system. This analysis will include structural computer modeling, structural analysis, and design. After the 1998 field verification testing, a contract will be issued to perform temporary measures required to ensure perforated plates remain in place until the FY 2000 permanent solution can be implemented. This will require pulling screens, and performing additional welding to ensure perforated plates stay attached through the 99 fish season.

In FY 99 a contract will be prepared to fabricate, deliver, install and field test retrofitted plates and connections at locations on an ESBS, at both McNary and Little Goose. The plates will be installed and subjected to various loading conditions to verify performance, similar to the mechanical field tests. In addition to the contract, it is anticipated WES staff will be utilized to perform data collection and analysis. If tests verify the design, a final contract will be implemented in FY 2000 to retrofit or replace the existing perforated plate and connections at all NWW projects with ESBS systems.

The screen control system also requires a dependable seal between the motor and the gearbox. During the 1997/98 winter maintenance at McNary it was observed that most motor seals failed. It will be necessary to install, at McNary and all projects with ESBS systems, new motor seals, couplings, and gearbox lubricant to ensure proper screen cleaning operation.

g. AFEP Activities - Complete the post-construction evaluation (AFEP) of the orifice passage efficiency with the extended-length submerged bar screens (ESBS) with and without orifice shelter and outlet flow control devices (OFC). Determine the condition (descaling rates) of juvenile fish in the gatewells while passing through the orifice shelter. Testing also includes the operation of the power units outside their 1% operating efficiency range. Debris conditions will also be monitored. (AFEP study MPE-W-97-2). Evaluate the effects of the prototype cylindrical dewatering system on the passage of juvenile and adult fish (chinook, steelhead and sockeye), including stress, descaling, injury and passage rates. Monitor passage behavior to determine problems and holding areas (AFEP study MPE-W-99-1) (See one page summaries attached)

h. Replace Gates and Stop-Logs. The juvenile fish collection channel at McNary is located within the original ice/trash sluiceway. The system of steel gates and stoplogs, installed as part of the original lock and dam construction,

restrain forebay water from entering the collection channel. The ice/trash sluiceway was not originally designed for frequent personnel access, and the existing gates and stoplogs do not provide an acceptable level of safety for personnel who now frequently work in or around the collection channel. The top of the gates is not high enough to prevent spray from wind and waves from blowing into the collection channel. This causes severe icing problems during winter months. . A report prepared in 1995, *McNary Lock and Dam, Summary of Justification, Modifications to Ice-Trash Sluiceway Regulating Gates and Stoplogs*, addressed different alternatives for solving these problems. The recommended alternative, will be to replace the existing gates and stoplogs with new precast concrete bulkheads grouted permanently in place in the stoplog slots. Installing these new bulkheads will resolve the safety concerns and prevent debris, spray, and splashing water from entering the collection channel.

i. Reservoir Debris Management - Long Term. The McNary project is not equipped with a trash debris boom to divert floating debris away from the powerhouse. This allows immense floating debris mats to form upstream of the powerhouse. In addition to the floating woody material, large quantities of submerged or neutrally buoyant fine debris, such as twigs, straw, tumbleweeds, leaves, and aquatic plants, approach the dam. The type of debris varies throughout the season, with mostly woody debris arriving in the spring and aquatic plant material, such as Eurasian milfoil and curly leaf pondweed, arriving in the summer and fall. The problems experienced at McNary on the screen systems are typically related to the fine debris, which has caused substantial daily cleaning on VBS's, problems at the dewatering screens, and constant removal and plugging at the downstream fish facility. In 1996, the floor dewatering system at McNary collapsed due to debris accumulations and plugging of the system.

A contract was initiated in FY 97 to remove debris from the forebay. During one of the cleaning operations, there was not enough time to completely remove, chip, and dispose of the collected debris before the end of the fiscal year, and the end of the contract. To offset the annual costs of renting equipment and initiating contracts, it is recommended in FY 99 that an adequate tugboat be purchased which would allow project personnel to remove debris, when necessary. Project labor would need to be available for this alternative, but it would be substantially less costly than either a trash shear boom or an annual debris removal contract.

j. JBS Engineering Evaluation - The existing JBS has experienced periodic problems which has resulted in emergency actions being taken to protect fish. The purpose of this evaluation would be to take a comprehensive look at the entire JBS, identify bugs and recommend steps to resolve any problems identified.

### **3. Schedule & Costs**

ID	Task Name	FY99	1999					20	
			Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2
1	Short Term Debris Contract	\$300k							
2	Long Term Debris Removal-Equip Purchase	\$650							
3	System Wide Screen Report	\$320							
4	Replace Collection Channel Stop Logs	\$500k							
5	Orifice Shelter Design/Install	\$100k							
6	Dewater Screen Panels Installation	\$300k							
7	Cylindrical Dewatering Prototype Design	\$200k							
8	ESBS Perf. Plate Revisions	\$500k							
9	JBS Engineering Evaluation	\$200k							
10	Orifice Shelter Evaluations - AFEP	<u>\$380k</u>							
11	Total	<b>\$3450k</b>							

#### 4. Other Information

a. Biological Opinion Measures - Reasonable and Prudent Measure #19 required the installation of extended-length screens at McNary for the 1997 season. That requirement was met.

b. ESA Effects - N/A.

c. Points of Contact:

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# Ice Harbor and McNary Dams Adult Fallback and Delay in the Collection Galleries

FY 99 Work Plan

## 1. Purpose and Objectives

Adult steelhead are known to fallback and hold in collection channels at Ice Harbor and McNary Dams. In the past, some of these fish jumped out of the channel and died. Nets were installed to prevent this type of mortality. However, the adult steelhead continue to be injured as they jump against the nets. The objective is to complete and evaluation of alternatives to prevent steelhead from exposure to this problem and develop and implement further corrective measures that will reduce the injury and delay of adult steelhead.

## 2. Activities/Tasks

a. Research problem: Establish a small interdisciplinary team to conduct site investigations, interview project and NMFS biologists. Document problems and identify agreed desired outcomes. Present issue at FFDRWG for discussion.

b. Report: Prepare a summary report to coordinate a prototype design, estimate costs, and coordinate monitoring efforts.

## 3. Schedule & Costs

ID	Task Name	FY99	1999											
			Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	
1	Research Problem - Identify Solutions	\$20k												
2	Coordinate with Region/Desired Outcomes	\$10k												
3	Start Report													
4	Prepare 30% Draft Report	\$20k												
5	Review/Coordination Meeting													
6	Prepare 60% Draft	\$20k												
7	Review/Coordination Meeting													
8	Prepare 100% Draft	\$15k												
9	Review/Coordination Meeting													
10	Technical Review	\$5k												
11	Prepare Final Report	\$10k												
12	Total	\$100k												



#### 4. Other Information

a. Biological Opinion Measure - Incidental Take Statement Measure 2.g. Steelhead BiOp IT 2.g. requires the Corps, in coordination with the Regional Forum, to investigate the problem of attraction and delay of adult fallbacks in specific parts of the juvenile collection galleries at Ice Harbor and McNary Dams. A report to NMFS stating the findings of these investigations and recommending corrective measures and implementation schedules must be submitted 2001.

b. ESA Effects - N/A

c. Points of Contact

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# **McNary Fish Ladder Exit Modification**

FY 99 Work Plan

## **1. Purpose/Objectives.**

The reservoir level at McNary Dam fluctuates on a daily basis, this requires manual manipulation of the series of tilting weirs and a telescoping weir to regulate flows to the Washington and Oregon fish ladders at the project. The goal is to reduce the potential of delaying in-migrating adult salmonids by simplifying and improving the fish ladder exits. The proposed modification will replace the manually operated system with fixed vertical-slot control weirs that do not require adjustments. Makeup water will be added to the ladders to meet water flow requirements. FY 99 objectives related to the project fish ladder modifications include:

- Develop hydraulic design information required for the two fish ladder's water supply.
- Complete contract plans and specifications for the fixed weir system ladder modifications.

## **2. Activities/Tasks**

a. Hydraulic Investigation. In FY 99 develop hydraulic information to determine the fish ladder's water supply requirements. Vertical slot ladders use varying flows and pool and weir ladders require constant flows. The vertical slots may not supply adequate flows to pool and weir sections. The required water supply to the ladders may include or be a combination of a new pumped water supply system, a new water supply conduit, or use of the existing water supply if model studies determine that the fish ladders can be modified to use the existing water supply system.


b. Model Studies Issues. Depending on the vertical slot section used, it is necessary to model study the fish ladder design to insure that undesirable flow conditions are not created causing fish to hold in the fish ladders.

c. Plans & Specifications. Develop plans and specifications for a fixed weir system and additional water supply for the two fish ladders

d. AFEP Activities. Biological studies to evaluate the effects of adult fish ladder exit modifications on adult passage rates, fallback through the ladder, and spawning success are not scheduled to begin until the year 2000. A one

pager proposing an evaluation of the final changes is attached for information purposes.

### 3. Schedule & Costs

Task Name	FY 99	1998			1999			
		Q2	Q3	Q4	Q1	Q2	Q3	Q4
FISH LADDER EXIT MODS								
Model & Design Costs	\$350k							
Total	\$350k							

### 4. Other Information.

a. The exit mods were proposed under the Project Improvement for Endangered Species (PIES) Program in 1992. It was also a recommended action in the System Configuration Study Phase I report of April 1994. In the Biological Opinion under Conservation Measure #3, it was recommended that the COE continue to implement and refine modifications established under the PIES program.

b. ESA Effects - N/A

c. Point of Contact

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# Surface Bypass and Collection (SBC) Lower Granite Project

## FY99 Work Plan

### 1. Purpose/Objectives

The scope and purpose of this work item is currently under discussion through the regional forum. Final plans could change based on the outcome of those discussions. Based on current understanding, the primary objective of FY99 work will be to work extensively with the region and define and prepare for an optimal FY00 test. At the same time, the SBC/BGS will be operated with a minimal level of monitoring in FY99. At this time, it cannot be characterized as a test. It is critical that one more year of testing at Granite occur. A structural analysis of the SBC has determined that significant deterioration has taken place and that FY00 is the final year that the structure can be utilized for a test. It will be removed from the water at the conclusion of the FY00 test.

### 2. Activities/Tasks

Continue to study FY98 BGS/SWI test results. Collaborate with the region in defining the most optimal test that can be conducted in FY00. Major activities will include numerical and physical modeling, further evaluation of test results to date and defining test conditions and objectives for FY00. In conjunction with development of a test proposal, necessary modifications to the SBC/BGS will either be defined or performed.

### 3. Schedule & Cost

ID	Task Name	FY99						1999								
			Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	
1	FY98 Contract Closeout	\$1000k														
2	FY99 - Operate SBC/BGS	\$500k														
3	Purchase Winches	\$400k														
4	FY98 Test AFEP Closeout	\$550k														
5	BGS Rehab	\$600k														
6	E&D	\$525k														
7	Numerical Modeling	\$75k														
8	WES Modeling	\$75k														
9		\$3725k														

#### 4. Other Information

a. Biological Opinion Measure - Reasonable and Prudent Measure (RPA) #11 requires the Corps to investigate the application of surface collection technology at lower Snake and Columbia River projects.

b. ESA Effects - Necessary consultation specific to each year's activities are conducted with NMFS. Researchers obtain NMFS permits and NMFS provides overall approval, under their ESA authority, to execute each year's prototype test.

c. Points of Contact

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